THE FALLING LEVEL OF THE CASPIAN SEA

Since 1929, the level of the Caspian Sea has dropped sharply. As a result, significant changes have occurred in the configuration of the shoreline. Dry land of poor quality has replaced many acres of valuable fishing grounds, and the problem of shoaling in both oil and fishing ports is becoming increasingly serious. Projects to restore the sea to its former level have thus far proved impracticable. Because of the extent of economic losses, a conference of Soviet scientists and engineers was called in early September in Astrakhan', and out of the renewed consideration of the problem may come a workable solution.

The level of the Caspian Sea has never been stable for any long period. Records, which date back to the middle of the sixteenth century, show that until the year 1929 the level of the sea fluctuated between a high of 22 meters below sea level and a low of 26 meters. Since 1929 the level of the sea has dropped continuously, until it now stands at approximately 28 meters below sea level. This means that for the last 27 years the water from rivers flowing into the sea and from rainfall over the sea has not been sufficient to compensate for the loss of water through evaporation from the surface of the sea and its adjoining bays and gulfs.

Evaporation from the surface of the sea accounts for the loss of some 400 cubic kilometers of water each year. The flow of water into Kara-Bogaz-Gol, which is consistently lower than the Caspian Sea because of a faster rate of evaporation, also accounts for considerable

loss of water. Estimates of the yearly flow into the gulf vary from 12 to 22 cubic kilometers, because of conflicting theories concerning the effect of the lowering of the sea level on the channel of the gulf. Some reports indicate that the bottom of the channel is eroding and is becoming lower along with the sea level; others indicate that the channel bottom is remaining constant and that the flow of water is therefore decreasing as the level of the sea lowers. At any rate the total loss is in excess of 412 cubic kilometers a year.

The yearly flow into the Caspian from the rivers of its drainage basin and subterranean water amounts to 329 cubic kilometers, and precipitation falling on the sea amounts to 72 cubic kilometers. This total gain of 401 cubic kilometers a year falls short of the annual loss by at least 11 cubic kilometers.

Two basic factors are involved in the reduced water intake of the Caspian: (1) a gradual warming of climate, and (2) the retention of water along the basins of rivers that flow into the sea. An increase in temperature affects the evaporation rate not only on the sea but also throughout its entire drainage basin, thereby considerably reducing the amount of water draining from the land into rivers and hence the flow of rivers into the sea. During the last hundred years the mean annual temperature of the Caspian basin has increased more than 1 degree. Although this may seem like a negligible increase, it has been estimated that a 1-degree rise in temperature could cause a decrease of 10 to 15% ~~in the water intake~~ in the flow of the Volga.

The Volga River provides well over half of the yearly inflow of the Caspian. During the last 20 years the Volga's contribution has dropped to 200 to 220 cubic kilometers from a previous yearly average of 253 cubic kilometers. Hydroelectric projects built on the Volga in recent years are retaining an increasing amount of water in the river basin. Rybinsk reservoir on the upper Volga was completed in 1941 and is filled. Huge dams at Gorodets, Kuybyshev, and Stalingrad are in various stages of completion, and their reservoirs are gradually filling. A number of other dams on the Volga are planned or in the initial stages of construction. The Kama reservoir on the upper Kama River also holds back an enormous quantity of water that would normally flow into the Volga. It is likely that the amount of Volga water entering the Caspian will continue to decrease as all the new reservoirs fill. Furthermore, future irrigation projects associated with the reservoirs may result in the loss of additional water. Although the loss of water to the Caspian Sea because of these projects presents a serious problem, the power produced by the new hydroelectric stations has been of tremendous importance to industrial development.

The shoreline of the Caspian Sea has been significantly altered by the lowering of the sea level, particularly in the northern basin where depths are very shallow. The 1930 area of the sea was 424,300 square kilometers, but by 1952 the area had shrunk to 392,300 square kilometers. The most noticeable change in the outline of the sea is in the northeastern corner, where the former shallow bays of Kaydak and Mërtvyy Kultuk have dried up. All along the northern shores the water has

receded and many islands have been uncovered -- some of them now inhabited. Even in the southern Caspian where depths are generally much greater, the shoreline has been altered. The tip of the Apsheron Peninsula, which was once Shakhov Island, is now Cape Shakhov. The former Cheleken Island is now Cheleken Peninsula.

Economic losses due to the shrinking of the sea have been estimated at 1 billion rubles a year. The northern Caspian fishing industry is being seriously affected. Already, some 11 million acres of shallow, warm water have dried up. One report states that the fish catch has been cut in half. The oil industry has been affected chiefly in the transport phase. Exploitation of the rich petroleum deposits under the sea will not be significantly affected by the lowering of the water, but the shoaling of ports has already become a serious problem affecting transport. At Baku, the major oil port, constant dredging is necessary to maintain sufficient depth. Astrakhan', shown as a Caspian port on old charts, is now 60 miles inland on the Volga. The city is served by a 116-mile sea canal that connects it with a roadstead out in deep water. Here Caspian tankers must transfer their cargo to vessels of lighter draft in order to enter the canal and the river. Constant dredging is necessary to maintain the depth of the canal, and if the level of the sea continues to drop the canal will probably have to be extended in order to reach deep water. Shoaling is also experienced at lesser ports of the Caspian. Guryev maintains a canal and roadstead system like that of Astrakhan'; at Krasnovodsk on the eastern shore, dredging is necessary to maintain sufficient depth in the port area.

Several ambitious proposals have been advanced to halt the shrinking of the sea and restore its former outline, but thus far most of them have been abandoned as impracticable or too expensive. The Chief Turkmen Canal was to have carried water to the Caspian from the Amu-Darya, but this project has been abandoned since Stalin's death. Another proposal called for the diversion of certain north-flowing rivers into the Caspian. One such project remains under consideration. It proposes the impounding of the waters of the upper Pechora River by a series of dams and the diversion of the waters into the Kama. Diversion of the Don River was also considered, but the waters of the Don were already being utilized.

The latest plan, reportedly proposed at the meeting of Soviet scientists and engineers in Astrakhan', is to build a 450-kilometer dam across the northern end of the sea from Kulaly Island southwest to a point, as yet undesignated, on the western shore. If this plan is feasible, it would raise the level of the sea in its northern basin, thereby restoring the failing fishing industry and reviving the northern ports. The shoaling of southern oil ports, however, would undoubtedly be increased, since the inflow deficit of the Caspian Sea would still remain and its effects would be concentrated in the southern basin. Moreover, the southern shore of the Caspian is not Soviet territory. It is likely that shoaling of Iranian ports would bring protests from the Iranians unless the Soviets agreed to bear dredging and other expenses resulting from the lowering of the level of the Caspian Sea.